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(54) Title: METAL POWDER AND SPONGE AND PROCESSES FOR THE PRODUCTION THEREOF

(57) Abstract

Passified Zinc Soluble Metal-Based Metal particles having a controlled particle size distribution suitable for metallurgy usage without additional particle size reduction and process for making the same. Such metal particles are substantially free of halides, hydrogen, oxygen, nitrogen and carbon and are produced at temperatures considerably below that of arc melting temperatures of Zinc Soluble Metal-Based Metal and alloys based thereon.

Summary of the Invention

This invention relates to the passified Zinc Soluble Metal-Based Metal particles which are substantially free of halides, and which are suitable for powder metallurgy usage without further particle size reduction, and processes for the production thereof. "Particles" as used herein is meant to include powders and granules as well as particles.

Zinc Soluble Metal-Based Metal is a metal or a mixture or alloy of two or more of such metals that has a solubility of at least about 3% by weight in molten zinc at 900°C. The Zinc Soluble Metal-Based Metal can contain alloying agents that do not meet the solubility, vapor pressure and melting point criteria of the Zinc Soluble Metal-Based Metal. Although antimony has a melting point of less than 900°C, alloys or mixtures of antimony and/or lithium and Zinc Soluble Metal-Based Metals are considered Zinc Soluble Metal-Based Metals when the alloys or mixtures meet the above solubility, vapor pressure and melting point specifications. The Zinc Soluble Metal-Based Metals of the present invention are Ti, Mn, Fe, Co, Ni, Cu, G, Y, Zr, Rh, Pd, Ag, Sb, La, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Lu, Hf, Pt, Au, Ac, Th, Pa, U and mixtures thereof, including alloys thereof. The mixtures and alloys consist essentially of one or more Zinc Soluble Metal-Based Metals and lesser amounts of other elements; provided, however, that such mixtures and alloys can contain up to 50% or more by weight of the other elements if the resulting mixtures and alloys meet the above solubility, vapor pressure, and melting point specifications.

A very important advantage of this invention is the capability of producing metal shapes, i.e., near net shapes, directly from metal sponge particles without the necessity of any expensive arc melting step which is required in conventional technology for cons lidation or alloying of the Group IVb transition metals.

Such metal values will comprise essentially the pure Zinc Soluble Metal-Based Metal or mixtures or alloys thereof optionally containing other alloying agents desirable in the ultimate final product, that is, alloys thereof. For example, such other alloying agents which may be desirable in the final product and known to those skilled in the art include, but are not limited to, berylium, boron, carbon, oxygen, aluminum, silicon, phosphorus, calcium, vanadium, chromium, arsenic, selenium, gallium, polybdenum, cadium, iridium, tin, cesium, niobium, barium, thallium, lead, bismuth, zinc and the like. These other elements may be used in the processes described herein.

Such alloying agents may be incorporated in small amounts as, for example, less than 5 weight percent individually and less than 10 weight percent collectively, because of limited solubility in molten zinc or because they possess a low boiling point as, for example, a boiling point below 900°C. However, the Zinc Soluble Metal-Based Metal containing the alloying agents must have a boiling point above 1000°C to prevent loss of the alloying agents during the zinc sublimation stage of the Metal values-zinc alloy.

Zinc Soluble Metal-Based Metals containing such other alloying agents will consist of a major portion of Ti, Mn, Fe, Co, Ni, Cu, Ge, Y, Zr, Rh, Pd, Ag, Sb, La, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm, Lu, Hf, Pt, Au, Ac, Th, Pa, U and mixtures thereof, and a minor portion of alloying agents, such as B, C, O, N, Al, Si, P, Ca, V, Cr, As, Se, Ga, Mo, Cd, Ir, Sn, Cs, Nb, Ba, Pb, Bi, Zn and mixtures thereof. The alloying agents made up the minor portion of the Metal values. Typically each alloying agent, if present, is alloyed in the Metal values in the following amounts, in weight percent:

B	0-7.0
C	0-7.0
O	0-2.0

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TITLE: Metal powder and sponge - contg. metal particles of specific size obtd. by forming an alloy of the metals with zinc and heating

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BASIC-ABSTRACT:

Particles of Al, Ti, Mn, Fe, Co, Ni, Cu, Ge, Y, Zr, Rh, Pd, Ag, Sb, Hf, Pt, Au, Pr, U, or mixtures of these, or of alloys of Al, Ti, Mn, Fe, Co, Ni, Cu, Ge, Y, Zr, Rh, Pd, Ag, Sb, La, Pr, Nd, Sm, Gd, Tb, Dy, Ho, Er, Tm,Lu, Hf,

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Pt, Au, Ac, Th, Pa or U with minor amts. of B, C, O, Si, P, Ca, V, Cr, As, Se, Ga, Mo, Cd, Ir, Sn, Cs, Nb, Ba, Th, Pb, Bi or Zn have a particle size less than 30 mesh, less than 50ppm. halide and internal porosity of 5040 vol.%.

The particles are obtd. by forming an alloy of the pref. metals and elements with zinc, the alloy being free of halide and then heating the alloy between 500 deg. and 1150 deg.C to eliminate all zinc. The prod. is then sintered at 850 deg. to 1250 deg.C. The zinc alloy may be comminuted or atomised prior to zinc distn., alternatively the sintered sponge may be hydrided followed by comminution and then removed of hydrogen. Where necessary the final prod. in all cases is passivated by treatment with oxygen or nitrogen.

USE/ADVANTAGE - Prodn. of material for powder metallurgical processes. The material is halide-free and of a size suitable for use without further redn..

CHOSEN-DRAWING: Dwg.0/6

TITLE-TERMS: METAL POWDER SPONGE CONTAIN METAL PARTICLE SPECIFIC SIZE OBTAIN FORMING ALLOY METAL ZINC HEAT

DERWENT-CLASS: M22 M26 P53

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